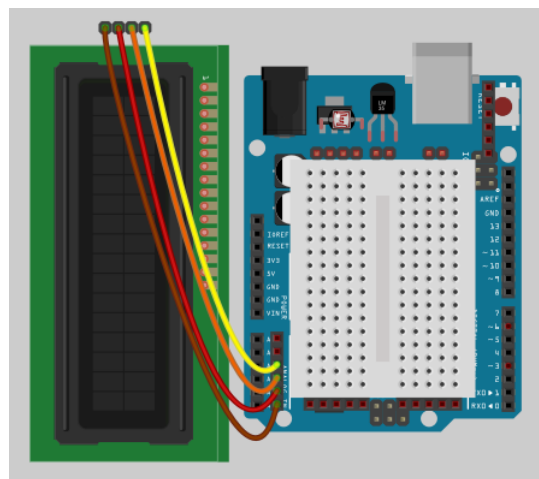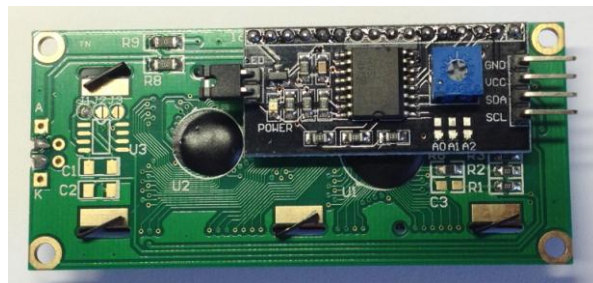# Arduino IIC/I2C 1602 LCD 模組

Arduino 控制板 IO 腳位只有 20 個，加些感測器或其他元件後，IO 就不夠用了。若要接個 1602 液晶顯示器則需要 7 個 IO 才能完成，但若透過 I2C 則只需 2 個 IO 即可完成。

- 電壓：+5V
- 支援 I2C 協定
- 具有背光 Led 和對比度調節電位器
- 4 線輸出
- I2C 位址 ：0x27

其腳位定義如下 ：

Pin	ID	說明
1	GND	接 GND
2	VCC	接 5V
3	SDA	Data 接 Arduino 類比 A4 Pin
4	SCL	Clock 接 Arduino 類比 A5 Pin

軟體常用函數使用說明(LCD Library）：

- begin(cols,rows) ：設定 LCD 的行與列的數目
- clear() ：清除螢幕並將游標移至左上角
- setCursor(col,row) ：將游標移至(col,row)位置
- backlight() ：打開背光 Led
- noBacklight() ：關掉背光 Led
- print(val,format) ：將 val 顯示在 Lcd 上
- scrollDisplayLeft() ：向左循環顯示
- scrollDisplayRight() ：向右循環顯示

I2C 1602 LCD 程式範例：

```cpp
#include <Wire.h>
#include <LCD.h>
#include <LiquidCrystal_I2C.h> // F Malpartida's NewLiquidCrystal library
//需下載 LiquidCrystal_I2C Library : https://bitbucket.org/fmalpartida/new-liquidcrystal/downloads
//並將其取代原先 LiquidCrystal library,可將其移至他處或改名即可

#define I2C_ADDR    0x27  // Define I2C Address for the PCF8574T
//---(Following are the PCF8574 pin assignments to LCD connections )----
#define BACKLIGHT_PIN  3
#define  LED_OFF   1
#define  LED_ON   0


/*-----( 宣告 I2C LCD 物件/Declare objects )-----*/
LiquidCrystal_I2C  lcd(I2C_ADDR,2,1,0,4,5,6,7); // declare I2C LCD object

void setup()   /*----( SETUP: RUNS ONCE )----*/
{
  lcd.begin (16,2);  // initialize the lcd
// Switch on the backlight
  lcd.setBacklightPin(BACKLIGHT_PIN,POSITIVE);
  lcd.setBacklight(LED_ON); // Turn on 背光 LED
  lcd.backlight();  //Backlight ON if under program control
  lcd.setCursor(0,0); //Start at character 0 on line 0
  lcd.print("Hello, world!"); //從位置第 0 行起頭(0,0)開始顯示
  lcd.setCursor(0,1);// 設定游標位置在第一行起頭
  lcd.print("Appsduino");
}// END Setup


void loop()
{
} // END Loop
```
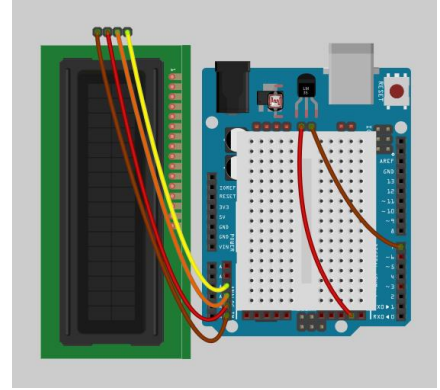
I2C 1602 LCD 顯示溫度(DS18B20)程式範例 :

```
//---------------------------------------------------
//    每秒讀一次溫度(DS18B20)並顯示在 LCD 上
//---------------------------------------------------
#include <Streaming.h>
/*-----( Import needed libraries )-----*/
#include <Wire.h>
#include <LCD.h>
#include <LiquidCrystal_I2C.h>  // F Malpartida's NewLiquidCrystal library
//-----( Declare Constants )-----
#define I2C_ADDR    0x27  // Define I2C Address for the PCF8574T
//---(Following are the PCF8574 pin assignments to LCD connections )----
#define BACKLIGHT_PIN  3
#define  LED_OFF  1
#define  LED_ON  0
/*-----( Declare objects )-----*/
LiquidCrystal_I2C  lcd(I2C_ADDR,2,1,0,4,5,6,7); // declare I2C LCD object
//-------- DS18B20 Temperature sensor -------------
#define   DS18B20_Pin   7  //Define DS18S20 onewire signal pin on D7
#include <OneWire.h>
#include <DS18B20.h>
DS18B20 dd(DS18B20_Pin);  // on digital pin 7
//-------------------------------------------------------------
void setup()
{
   lcd.begin(16, 2);    //Initialize LCD as 16 x 2
   // Switch on the backlight
   lcd.setBacklightPin(BACKLIGHT_PIN,POSITIVE);
   lcd.setBacklight(LED_ON);
   lcd.backlight();  //Backlight ON if under program control
   lcd.print("Temp : ") ;
}
void loop()
{
    float Temp ;
    Temp = dd.getTemperature();    // read the temperature from DS18B20
    lcd.setCursor(7,0);    // Display from position 7 and line 0
    lcd << _FLOAT(Temp, 2) << (char)(0xDF) << "C " ;// LCD degree "o" Char
    delay(1000) ;
}
```

> 請將所附之 libraries 拷貝至安裝 arduino IDE 目錄之 libraries 資料夾內(若有相同,取代之)